Maline Creek Whole Body Contact Recreation Use Attainability Analysis

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Prepared for: METROPOLITAN ST. LOUIS SEWER DISTRICT

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I. INTRODUCTION

In September 2000, U.S. EPA Region VII (EPA) notified Missouri Department of Natural Resources (MDNR) that several items contained within Missouri's Water Quality Standards were inconsistent with the intent of the Federal Clean Water Act of 1972 (CWA). EPA noted that MDNR's limited designation of streams for swimming uses was inconsistent with the CWA. Section 101(a)(2) of the CWA establishes as a national goal "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water," wherever attainable. This goal presumes that all waters should be suitable for fishing and swimming unless these uses are unattainable per 40 Code of Federal Regulations (CFR) 131.10. The MDNR currently designates only 10% of Missouri's classified waters as having Whole Body Contact Recreation (WBCR) uses (swimming).

In response to concerns raised by EPA, MDNR is proposing WBCR use designation of all classified waters listed in State regulations. However as allowed by federal regulations, a Use Attainability Analysis (UAA) may be conducted to determine if WBCR use is an appropriate and attainable use for a specific waterbody.

A UAA is a structured scientific assessment of the factors affecting use attainment, which may include physical, chemical, biological, and economic factors. If a designated use is not an existing use attained on or after November 28, 1975, one of the following attainability factors must justify the removal or downgrading of a designated use (from 40 CFR 131.10(g)):

- (1) Naturally occurring pollutant concentrations prevent the attainment of the use;
- (2) Natural, ephemeral, intermittent, or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for with sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;
- (3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;
- (4) Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modifications in a way that would result in the attainment of the use;
- (5) Physical conditions related to the natural features of the water body, such as lack of proper substrate, cover, flow, depth, pools, riffles, and the like unrelated to water quality, preclude attainment of aquatic life protection uses; or
- (6) Controls more stringent than those required by Title III Sections 301 and 306 of the CWA would result in substantial and widespread economic and social impact.

MDNR, in cooperation with State, Federal, Municipal, and private entities, developed a recreational UAA protocol for Missouri waters. This recreational UAA framework addresses use attainability factors that may allow removal or downgrading of WBCR uses for specified waterbody segments. Missouri WBCR UAAs may include, but are not limited to: field observations of swimming areas, sampling for pathogenic indicator bacteria, and interviews of nearby residents to determine historic recreational use.

The Metropolitan St. Louis Sewer District (MSD) is interested in determining whether or not WBCR is an existing or attainable use for Maline Creek. Ongoing combined sewer overflow (CSO) control planning efforts should be founded on realistic and achievable goals for area receiving waters. MSD is concerned about potentially expending excessive public financial resources in pursuit of a WBCR goal if it is not attainable. To address these concerns, Maline Creek, a classified intermittent tributary to the Mississippi River receiving urban runoff and CSO discharges, was evaluated for existing, potential, and attainable WBCR uses. Field surveys were conducted in October 2004. The assessment described herein is expected to meet or exceed the requirements set forth by MDNR in available UAA protocols for evaluating recreational uses (MDNR 2004).

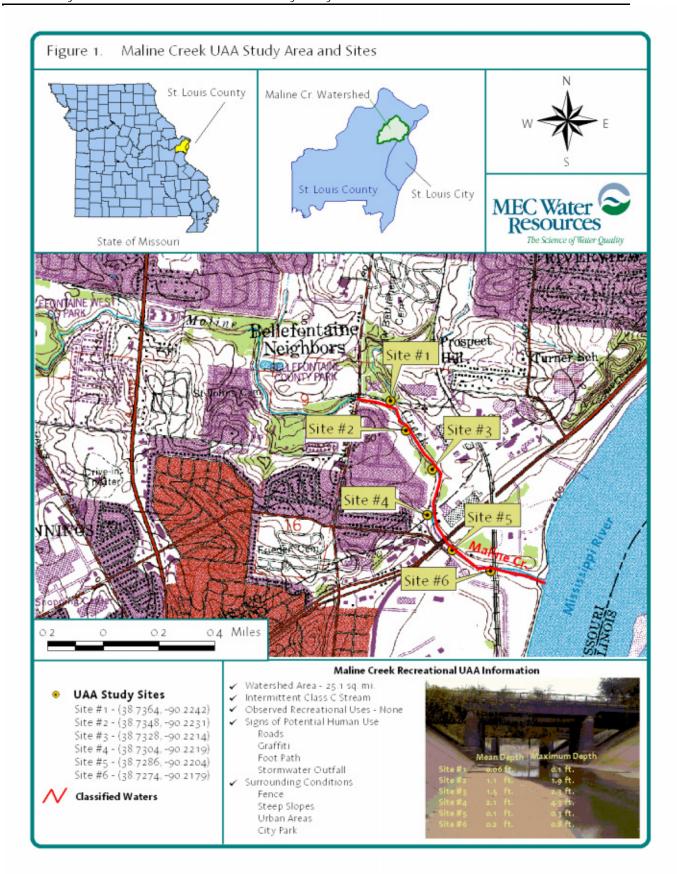
II. STUDY AREA

A one-mile segment of Maline Creek (Figure 1) is a Class C Water of the State and an intermittently flowing tributary to the Mississippi River (Blunt 2004). Beneficial uses currently designated for Maline Creek include: Protection of Warm-Water Aquatic Life, Livestock and Wildlife Watering, and Human Health protection (Fish Consumption and Secondary Contact Recreation). Draining a 25.1 mi.² urbanized watershed in northeast St. Louis County, landuses of Maline Creek are 59% residential, 13% public, 9% undeveloped, 11% commercial or industrial, 7% recreational, and 1% transportation (SSPC 2002). Overall, the Maline Creek watershed is composed of 32% impervious area resulting in increased stormwater runoff volumes and peak flows (SSPC 2002). The Maline Creek watershed is contained within the larger Cahokia-Joachim catchment (8-digit HUC 07140101) and State assigned waterbody identification number is 1709.

III. METHODS AND MATERIALS

Procedures developed by MDNR for conducting recreational UAAs were the primary reference for this study (MDNR 2004). In summary, MDNR UAA procedures contain the minimum elements listed below:

- ∉ Surveys should generally be conducted during the regulatory recreational season (April 1 to October 31);
- ✓ Surveys should be conducted during baseflow conditions;
- Recreational assessments should be performed at a minimum of three publicly accessible sites along the stream reach of interest;
- ∉ All sites shall be marked on a 1:24,000 USGS topographic map;
- ∉ A photographic record should be prepared for each site that includes upstream and downstream views, in addition to any evidence of observed or potential recreational uses; and
- ∉ Interviews of persons present during the time of survey and nearby-residents.



In addition to MDNR site characterization requirements, MEC Water Resources, Inc. (MEC) staff collected systematic stream hydrogeometry and riparian corridor information at six evenly spaced sites along classified reaches of Maline Creek (Figure 1). Nearby residents, employees, a Missouri Stream Team #888 representative, and individuals observed near Maline Creek during surveys were interviewed with respect to personal, observed, and anecdotal recreational uses of Maline Creek.

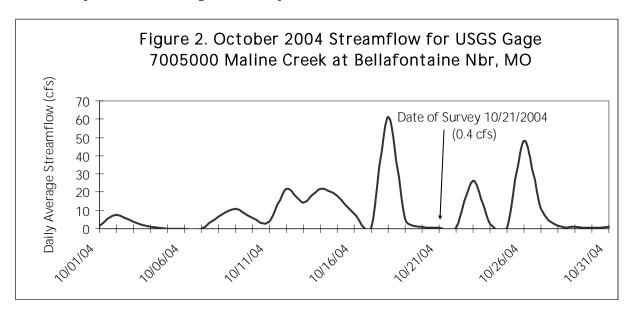
IV. RESULTS AND DISCUSSION

The following discussion is provided to aid decision-makers in evaluating appropriate recreational uses for Maline Creek. Although summarized in the following paragraphs, raw data collected during the survey is contained in Appendix A along with field data sheets required by MDNR UAA protocols (Data Sheets A and B¹).

A. Environmental Conditions

Six sites within classified sections of Maline Creek (Figure 1) were surveyed on October 21, 2004 using methods referenced and described in Section III. Surveys were conducted during baseflow conditions as evidenced by streamflow data from USGS gage station 07005000 Maline Creek at Bellefontaine Neighbors, MO (Figure 2). Streamflow conditions (0.4 cfs) observed during the survey are representative of baseflow conditions. Reduced infiltration of rainfall in urbanized catchments coupled with a relatively small watershed area (25.1 mi.²) likely limit periods of sustained baseflow. Regulatory classification (Class C) and the absence of upstream continuous discharges confirm that normal flow conditions are similar to those observed during the October 21 assessment.

Field surveys were conducted during the recreational season, as recommended by MDNR protocol. Weather conditions during the survey were stable with a mean daily air temperature of 58°F and mostly cloudy skies. Cooler temperatures may have limited the appeal of recreational activities within Maline Creek to an unknown extent. However, results from interviews are expected to reveal any recreational usage that may not have been directly observed by MEC staff during field surveys.



¹ Bacteriological data are presented in Appendix C in a different format than Data Sheet C.

B. Site Characterizations

Six sites along classified reaches of Maline Creek were assessed for existing, potential, and attainable recreational uses. All sites are located within the urban boundaries of Bellefontaine Neighbors, MO and St. Louis, MO. Doherty City Park adjacent to Sites 1 through 4, is bordered by a tall chain link fence that impedes access to Maline Creek (Figure 3).



Figure 3. Doherty City Park

Relatively steep banks, sections of concrete channel, and limited signs of human use characterize recreational use observations at most sites. Each site is described in the following sections to provide reviewers further detail. Lateral Transect depth measurements are provided in Appendix B.

1. Site #1. Maline Creek 5,100 feet Upstream from Mississippi River (38.7364, -90.2242)

Landscapes near Site #1 are essentially urban residential and commercial/industrial. A fence (Figure 4) along one side of the channel, a vertical constructed wall (Figure 5) along another, and a relatively dense riparian corridor nearby may impede recreational use. Banks are relatively steep, composed of concrete block on one side and a constructed wall along another.

Streamflow is transported as a thin sheet across a concrete channel at Site #1. Mean depth along a representative transect was 0.06 ft while the maximum observed depth was 0.1 ft. Waters were observed to be odorless, clear, and free of deposits. The presence of roads were the only signs of potential human use at this site (Table 1).

Figure 4. Maline Creek at Site #1 (Upstream View) Figure 5. Maline Creek at Site #1 (Downstream View)





Table 1. Site #1 Summary of Recreational Use and Depth Factors

Surrounding Conditions:	Fence, Steep Slopes, Urban Areas, City Park
Observed Uses:	None
Signs of Potential Human Use:	
Channel Substrate:	Concrete Block
	Steep, Composed of Concrete Block
	Clear, Odorless, Deposits Absent
Mean Depth:	
Maximum Depth:	0.1 ft.

2. Site #2. Maline Creek 4,470 feet Upstream from Mississippi River (38.7348, -90.2231)

A fence adjacent to a dense riparian corridor and constructed vertical wall along the channel may impede recreational use at Site #2 (Figures 6 and 7). Banks are steep and composed of a mud/cobble mixture on the left descending bank and a vertical constructed wall on the right descending bank.

Figure 6. Maline Creek at Site #2 (Upstream View) Figure 7. Maline Creek at Site #2 (Downstream View)





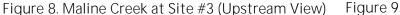
A control structure located near Site #4, promotes moderate ponding and backwater effects at Site #2. Channel substrate is 80% fine sediment and 20% cobble. Mean depth along a representative transect was 1.1 ft while the maximum observed depth was 1.9 ft. Waters were observed to be odorless, slightly brown in color, and free of deposits. Signs of potential human use were not observed at this site (Table 2).

Table 2. Site #2 Summary of Recreational Use and Depth Factors

Surrounding Conditions:	Fence, Steep Slopes, Urban Area
Observed Uses:	None
Signs of Potential Human Use:	None
Channel Substrate:	80% Mud/clay, 20% cobble
	Steep, Vertical Wall
Water Characteristics:	Brown Color, Odorless, Deposits Absent
Mean Depth:	
Maximum Depth:	1.9 ft.

3. Site #3. Maline Creek 3,570 feet Upstream from Mississippi River (38.7328, -90.2214)

A fence adjacent to a dense riparian corridor and constructed vertical wall along the channel may impede recreational use at Site #3 (Figures 8 and 9). Banks are steep and composed of a mud/cobble mixture on the left descending bank and a vertical constructed wall on the right descending bank.







Site #3 is a shallow pool resultant from a control structure located near Site #4. Channel substrate is 60% cobble, 20% mud/clay, 10% gravel, and 10% silt. Mean depth along a representative transect was 1.5 ft while the maximum observed depth was 2.3 ft. Waters were observed to be odorless, slightly brown in color, and free of deposits. Signs of potential human use were not observed at this site (Table 3).

Table 3. Site #3 Summary of Recreational Use and Depth Factors

•
Fence, Steep Slopes, City Parks
None
None
60% Cobble, 20% Mud/Clay, 10% Silt, 10% Gravel
Steep, Vertical Wall
Brown Color, Odorless, Deposits Absent
1.5 ft.
2.3 ft.

4. Site #4. Maline Creek 2,640 feet Upstream from Mississippi River (38.7304, -90.2219)

Although stream access is limited, graffiti along a small section of concrete streambank (Figures 10 and 11) suggests that fences and vertical containment walls at the site may not prevent determined access to the site.

Figure 10. Maline Creek at Site #4 (Upstream View)



Figure 11. Maline Creek at Site #4 (Downstream View)



Streamflow is slowed by a control structure (Figure 12) just downstream of Site #4, which likely represents the deepest section of Maline Creek. Mean depth across a representative transect was 2.1 ft. while the maximum observed depth was 4.3 ft. Channel substrate is mostly cobble upstream of the control structure and concrete-lined below.



Figure 12. Maline Creek Control Structure near Site #4

Waters were observed to be odorless, slightly brown in color, and free of deposits (Table 4). Signs of potential human use were limited to graffiti located on a concrete embankment upstream of the control structure.

Table 4. Site #4 Summary of Recreational Use and Depth Factors

Surrounding Conditions:	Fence, Steep Slopes, City Parks, Urban Areas
Observed Uses:	None
Signs of Potential Human Use:	Graffiti
Channel Substrate:	70% Cobble, 20% Silt, 10% Gravel
Bank Condition:	Steep, Vertical Wall
	Brown Color, Odorless, Deposits Absent
Mean Depth:	2.1 ft.
Maximum Depth:	4.3 ft.

5. Site #5. Maline Creek 1,800 feet Upstream from Mississippi River (38.7286, -90.2204)

Upstream of Site #5, the Maline Creek stream channel features steep concrete embankments and a sparse riparian corridor (Figure 13). Downstream, the stream transitions to a less disturbed state having natural substrates and more defined riparian areas (Figure 14).

Figure 13. Maline Creek at Site#5. (Upstream View)



Figure 14. Maline Creek at Site #5 (Downstream View)



Streamflow travels first as a thin sheet across a concrete channel then drops into a small scour pool downstream. Mean depth measured 0.1 ft while the maximum observed depth was 0.3 ft. Estimates were not obtained in the scour pool as the majority of the reach is lined with concrete. Waters were observed to be odorless, clear, free of deposits, and having limited growths of benthic algae (Table 5). Signs of potential human use were limited to graffiti and foot paths near a stormwater outfall.

Table 5. Site #5 Summary of Recreational Use and Depth Factors

Surrounding Conditions:	Fence, Steep Slopes, Urban Areas
Observed Uses:	None
Signs of Potential Human Use:	Grafitti, Foot Path, Stormwater Outfall
Channel Substrate:	Concrete Upstream, Cobble/Mud Mixture Downstream
Bank Condition:	Concrete Upstream, Cobble/Mud Mixture Downstream
Water Characteristics:	Colorless, Odorless, Deposits Absent, Benthic Algae
Mean Depth:	0.1 ft.
Maximum Depth:	0.3 ft.

6. Site #6. Maline Creek 930 feet Upstream from Mississippi River (38.7274, -90.2179)

Site #6 features steep cobble-strewn banks with a fence along the floodplain and a concrete lined channel (Figures 15 and 16). The riparian corridor is a thick mix of forbs and young trees. Manmade alterations to the stream channel terminate at a vertical drop approximately 300 feet upstream from the Mississippi River (Figure 17).

Figure 15. Maline Creek at Site#6. (Upstream View)



Figure 16. Maline Creek at Site #6 (Downstream View)



Streamflow is contained within a concrete channel as sheet flow. Mean depth measured 0.2 ft while the maximum observed depth was 0.8 ft. Waters were observed to be odorless, clear, free of deposits, and having limited growths of benthic algae (Table 6). Signs of potential human use were limited to graffiti near a bridge crossing. A CSO outfall is present within this reach.



Figure 17. View of the Mississippi River Confluence

Table 6. Site #6 Summary of Recreational Use and Depth Factors

Surrounding Conditions:	Fence, Steep Slopes
Observed Uses:	None
Signs of Potential Human Use:	Graffiti, CSO Outfall
Channel Substrate:	Mostly Concrete
Bank Condition:	Concrete/Cobble Mix
Water Characteristics:	Colorless, Odorless, Deposits Absent, Benthic Algae
Mean Depth:	0.2 ft.
Maximum Depth:	0.8 ft.

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Maline Creek

Whole Body Contact Recreation Use Attainability Analysis

C. Recreational Use Interviews

A representative of Missouri Stream Team #888 and six nearby residents, employees, or passers-by were interviewed by MEC staff as part of recreational use surveys (Appendix D). Questions asked of each interviewee include but are not limited to:

- ∉ Have you or your family used Maline Creek for recreational purposes?
- ∉ Have you personally observed another party using Maline Creek for recreational purposes?
- ∉ Have you heard of any party using Maline Creek for recreational purposes?

All interviewees responded that they had not directly used, observed use by another party, or heard of anyone using classified reaches of Maline Creek for whole body contact recreational purposes. Two individuals mentioned they had seen maintenance crews and teenagers on the top of the streambanks, but not within Maline Creek. Stream Team #888 indicated that several years ago there was a swimming hole in Maline Creek near Florissant Road; however, this location is several miles upstream of the classified study segment. Other than this anecdotal statement, this individual has never personally used it, observed it being used, or heard of anyone using it for such purposes.

V. WHOLE BODY CONTACT RECREATION USE CONSIDERATIONS

A designated use may only be downgraded or removed if this use is not an existing use and is considered unattainable. Therefore, the UAA process must include consideration of both existing uses and attainability of potential uses. The following sections include existing use and use attainability considerations that provide the basis for the WBCR use recommendations.

A. Existing Use Considerations

Provisions contained within the CWA prohibit removal of an existing use that was attained on or after November 28, 1975. Use attainment is measured by assessing compliance with applicable water quality standards (beneficial uses and water quality criteria). In the case of recreational contact uses (swimming, etc.), existing use considerations should be based upon attainment of both:

- The Beneficial Use, i.e. historic use of the waterbody in question for swimming, water skiing, skin diving, etc.; and
- The Water Quality Criteria that support the beneficial use, i.e. historical (after 11/28/75) and current levels of pathogen indicator bacteria.

In summary, a recreational use should be considered attained and existing when the waterbody is used for a specified recreational activity and is concurrently supported by levels of water quality adequate for the specific use.

Maline Creek

Whole Body Contact Recreation Use Attainability Analysis

1. Beneficial Use Evaluation

It is concluded that surveyed reaches of Maline Creek are not currently being used for WBCR activities based on:

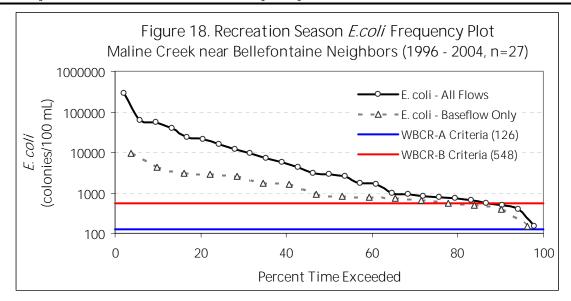
- ∉ Absence of observed use by MEC staff;
- ∉ Absence of observed use by local citizenry; and
- Absence of substantive evidence such as rope swings, docks, diving platforms, etc.

In addition, interviews with local citizenry did not yield any witnessed or anecdotal evidence of historical WBCR use. Steep banks, vertical containment walls, private property boundaries, and fencing along the stream channel limit potential use by restricting access to the general public. Therefore, WBCR is not an existing use within surveyed reaches of Maline Creek based on the absence of historical (since 1975) or current evidence of the use.

2. Water Quality Criteria Evaluation

MDNR is proposing a tiered approach to recreational use classification. The proposed Category A of WBCR (WBCR-A) will include waters that have been established as public swimming areas allowing full and free access by the public for swimming purposes and waters with existing whole body contact recreational use. MDNR currently proposes this WBCR use category for waters that are currently designated for WBCR in Missouri's Water Quality Standards. Water quality criteria assigned to the proposed WBCR-A use are fecal coliform and *E. coli* geometric means of 200 and126 colonies per 100 mL, respectively. These criteria are based upon an illness risk of 8 illnesses per 1000 WBCR exposures. Proposed category B of WBCR (WBCR-B) contains all other waters designated for WBCR not contained within Category A. The proposed Missouri Water Quality Standards regulations include WBCR-B use designation of Maline Creek. The water quality criterion assigned to WBCR-B is an *E. coli* geometric mean of 548 colonies /100 mL, based upon an illness risk of 14 illnesses per 1000 WBCR exposures.

A frequency plot of recreation season bacteria data collected by the U.S. Geologic Survey in Maline Creek from 1996 through 2004 (Appendix C) indicate that the proposed *E. coli* WBCR-A criterion was not met during the eight year period of record, even during baseflow conditions (Figure 18). In addition, the proposed *E. coli* WBCR-B criterion was exceeded within 86% of collected samples (Figure 18). Recreation season geometric means listed by year and flow condition indicate that neither the proposed WBCR-A or WBCR-B *E. coli* criteria were met (Table 7). The existing fecal coliform WBCR-A criterion has not been met near Bellafontaine Neighbors during the eight year period (Figure 19, Table 8). Therefore, available data indicate that Maline Creek water quality does not meet levels required to support WBCR uses during the recreation season.



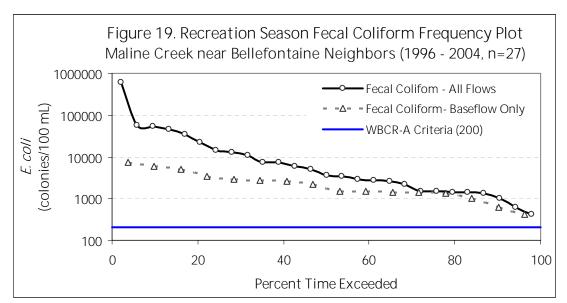


Table 7. Annual Recreation Season E. coli Concentrations in Maline Creek

All Flows		Baseflow Only		Only	
Year	Sample #	Geomean*	Year	Sample #	Geomean*
(YYYY)	(#)	(col./100 mL)	(YYYY)	(#)	(col./100 mL)
1996	2	12,514	1996	1	2,900
1997	4	3,914	1997	2	1,978
1998	2	8,246	1998	1	1,700
1999	3	2,150	1999	2	657
2000	3	1,548	2000	2	800
2001	4	8,176	2001	2	1,510
2002	3	3,079	2002	2	1,351
2003	4	2966	2003	2	554
2004	2	1,187	2004	2	1,187
1996 - 2004	27	3,630	1996 - 2004	16	1,152

*Geomeans based on less than 5 samples during steady-state conditions may not appropriately characterize central tendencies.

Table 8. Annual Recreation Season Fecal Coliform Concentrations in Maline Creek

All Flows			Baseflow Only		
Year	Sample #	Geomean*	Year	Sample #	Geomean*
(YYYY)	(#)	(col./100 mL)	(YYYY)	(#)	(col./100 mL)
1996	2	13,921	1996	1	3,400
1997	4	4,344	1997	2	1,466
1998	2	11,849	1998	1	2,600
1999	3	3,074	1999	2	924
2000	3	4,017	2000	2	3,000
2001	4	12,903	2001	2	2,049
2002	3	4,361	2002	2	2,526
2003	4	4866	2003	2	1349
2004	2	2,683	2004	2	2,683
1996 - 2004	27	5,613	1996 - 2004	16	1,970

*Geomeans based on less than 5 samples during steady-state conditions may not appropriately characterize central tendencies.

3. Existing Use Conclusions

Information and data collected during this study confirm that WBCR is not an *existing use* that has been *attained* in surveyed sections of Maline Creek. This existing use conclusion is based upon the absence of current or historical (post-11/28/75) evidence of WBCR use and *E. coli* and fecal coliform levels that exceed proposed water quality criteria that support the use.

B. Attainability of Whole Body Contact Recreational Use

The CWA precludes the removal of existing or attainable uses. As presented above, WBCR use within the surveyed reaches of Maline Creek is not an existing use. For WBCR to be considered unattainable, one or more of six conditions described in 40 CFR 131.10(g) and MNDR UAA protocols must be satisfied. Multiple use attainability factors outlined in Federal regulations may apply to Maline Creek, including use attainment prevented by natural concentrations of pollutants (Factor 1), low flow, shallow conditions (Factor 2), non-remedial human caused conditions (Factor 3), hydrologic modifications (Factor 4) and substantial and widespread economic and social impacts (Factor 6).

1. Natural Concentrations of Bacteria Prevent Use Attainment

Bacteria in urban stormwater runoff and baseflow originate from numerous sources. Bacterial source tracking studies completed in Blue River and Brush Creek, located within Kansas City, MO, yielded an even distribution between dogs (28.3%), geese (22.1%), humans (23.4%), and unknown sources (26.2%) (Wilkison et al. 2002). Nationally, an intensive effort in San Diego's Mission Bay determined 67% of pathogenic bacteria originated from avian sources, 9% from dogs, and only 5% from humans (Gruber et. al 2005). MSD has contracted with the U.S. Geologic Survey to conduct a bacterial source tracking study to characterize pathogen levels caused by natural and human sources. Results from the study may determine if natural bacteria alone could prevent WBCR use attainment.

2. Natural, Ephemeral, Intermittent, or Low Flow Conditions Prevent Use Attainment MDNR has determined that natural, ephemeral, intermittent, or low flow conditions prevent WBCR uses if:

- the average depth of the waterbody is less than 1.64 feet over 50% of all the water surveyed from an observation point; or
- ∉ the maximum depth less than 3.28 feet.

WBCR use is considered unattainable due to low flow and shallow conditions that are prevalent over the majority of the stream segment. Due to a stormwater control structure, one of six evaluated transects within classified reaches of Maline Creek exhibited an average depth greater than 1.64 feet and a maximum depth greater than 3.28 feet (Table 8). This location is not considered representative of Maline Creek and is relatively isolated, reducing the potential for WBCR use. Evidence of WBCR use was absent at this site and the only sign of human presence was graffiti on a concrete embankment.

Table 9. Ivia	rable 9. Mailie Creek Transect Depth Summary								
Transect	Mean Depth	Maximum Depth							
(#)	(ft.)	(ft.)							
Site #1	0.06	0.1							
Site #2	1.13	1.9							
Site #3	1.53	2.34							
Site #4	2.10	4.3							
Site #5	0.14	0.28							
Site #6	0.19	0.75							
Classified Reach	0.9	4.3							

Table 9. Maline Creek Transect Depth Summary

3. Non-Remedial Human Caused Conditions Prevent Use Attainment

There are no permitted continuous discharges in the Maline Creek watershed, yet proposed WBCR-B criteria are exceeded 90% of the time during baseflow conditions (see Section 5.A.2.). Influences from potential diffuse bacteria sources are not presently quantified in the watershed. However, landuse practices have remained essentially unchanged since 1975 based upon comparison of U.S. Geologic Survey Granite City Quadrangle maps generated in 1974 and 1998. This observation suggests that urban stormwater water quality has not significantly changed since 1975.

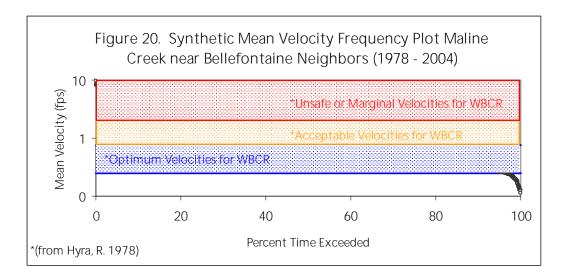
Attainment of WBCR uses may be challenging for many urban waters. Median bacteria concentrations (fecal coliform - 5,081 colonies/100mL, *E. coli* — 1,750 colonies/100 mL) collected from urban stormwater as part of the EPA National Pollutant Discharge Elimination System (NPDES) Phase 1 stormwater program exceed WBCR-A and WBCR-B criteria (Pitt et al. 2003). As the quality of urban runoff is often associated with land use, any significant changes to land use composition required to meet WBCR criteria may represent a non-remedial condition that prevents the use from being attained.

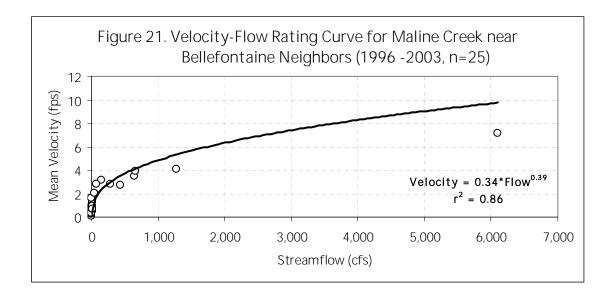
4. Hydrologic Modifications Prevent Use Attainment

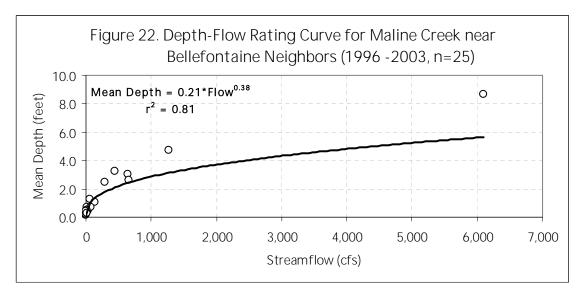
The channelization of Maline Creek and development of its watershed represent hydrologic modifications. Much of Maline Creek is channelized and lined with concrete. Coupled with increased runoff volumes and peak flows from impervious areas, channelized streams exhibit increased stream velocities for a given flow rate. A frequency plot (Figure 19) of mean velocities for flows recorded at the Bellafontaine gage was developed from the velocity-flow rating curve (Figure 20). According to Hyra (1978), optimal water velocities for swimming range from 0.25 to 0.75 feet per second (fps) while those exceeding 2 fps are considered marginal and unsafe at greater than 3 fps. Marginal swimming conditions based on velocity boundaries are exceeded approximately 6% of the time at the Bellefontaine gage and correspond to flows above approximately 100 cubic feet per second. However, shear forces and extraction challenges resultant from vertical containment walls and concrete embankments may present safety risks at velocities less than 2 fps. Further investigation into runoff and velocity regimes in the study area would allow identification of velocity hazards.

Water depths supporting WBCR at the Bellefontaine gage are apparently reached at flows that induce marginal or unsafe swimming velocities due to hydrologic modifications. Mean depth thresholds (≥1.64 feet) set forth in MDNR UAA protocols correspond to flows near 230 cfs according to the depth-flow rating curve developed for the Bellefontaine gage (Figure 21). However, the extent to which channel characteristics at the Bellefontaine gage are applicable to ungaged sites within the study reach is uncertain. Mean depth of surveyed reaches (0.9 ft) measured during October surveys at 0.4 cfs is larger than mean depths predicted at 0.4 cfs by the Bellefontaine depth-flow rating curve (0.15 ft.).

This analysis demonstrates that WBCR uses may be unattainable due to hydrologic modifications that result in high velocities during some periods of stormwater runoff.







5. Substantial and Widespread Social and Economic Impact Prevent Use Attainment MSD is in the process of developing a CSO Long Term Control Plan (LTCP). As part of the LTCP, the economic impacts of different CSO control options will be evaluated. The public participation process will also aid in determination the level of control and financial impact desired by the community. Other cities, such as Boston, Portland, and Milwaukee, have found that support of swimming uses in urban streams are not economically feasible.

VI. CONCLUSIONS

As currently delineated, the classified section of Maline Creek does not host existing WBCR uses due to the absence of observed or historical WBCR use and water quality that does not support swimming related activities. Therefore, WBCR is not an existing use.

WBCR is considered unattainable due to low flow and shallow conditions prevalent within the stream. Low-flow, shallow conditions were observed at five of six survey sites. Although maximum depth criteria were exceeded at Site #4, this stream segment is not representative of the entire classified segment and use of the site for swimming is unlikely due to the isolated and inaccessible nature of the area.

In addition to low-flow, shallow conditions preventing WBCR use attainability, several other use attainability factors may demonstrate that WBCR use is unattainable. Additional information is needed to determine if natural pollutant levels, non-remedial conditions, hydrologic modifications, or widespread economic impacts support removing WBCR as a use for Maline Creek.

VII. REFERENCES

- Blunt, M. 2004. Code of State Regulations; Missouri Water Quality Standards, Title 10 Division 20, Chapter 7.
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- Hyra, R. 1978. Methods for Assessing Instream Flows for Recreation. Cooperative Instream Flow Service Group, Fort Collins, CO.
- Missouri Department of Natural Resources. 2004. Recreational Use Attainability Analysis Protocol. Water Protection Program, Jefferson City, MO.
- Pitt, R., A. Maestre, and R. Morquecho. 2003. The National Stormwater Quality Database.

 Department of Civil and Environmental Engineering. University of Alabama. Tuscaloosa.
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- Wilkison, D., D. Armstrong, and D. Blevins. 2002. Effects of Wastewater and Combined Sewer Overflows on Water Quality in the Blue River Basin, Kansas City, Missouri and Kansas, July 1998-October 2000. Water-Resources Investigations Report 02-4107. U.S. Geological Survey, Rolla, MO.

Appendix A.

MDNR Recreational Use Stream Survey Forms (Data Sheets A and B)

Field Data Sheets for Recreational Use Stream Surveys

$Data\ Sheet\ A-Water\ Body\ Identification$

Water Body Name: Maline Creek
(from USGS 7.5' quad)
8-digit HUC: 07140101
Missouri WBID # 1709
County: St. Louis and St. Louis City
Upstream Legal Description: N/A French Survey
Downstream Legal Description: N/A French Survey
Upstream Coordinates: 38.73627, -90.22436
(USG 84, dd,dddd)
Downstream Coordinates: 38.72709, -90.21509
(USG 84, dd.dddd)
Discharger Facility Name(s): N/A
Discharger Permit Number(s): N/A
Number of Sites Evaluated: Six (6)
Name of Surveyor and Telephone Number: Trent Stober (573) 443-4100
Organization: MEC Water Resources, Inc.
Position: Senior Project Manager
I, the undersigned, hereby affirm to the best of my knowledge, that all information
reported on this IIAA datasheet is true and accurate

reported on this UAA datasheet is true and accurate.

Signed: Let	Date: 7/7/05
	

Field Data Sheets for Recreational Use Stream Surveys

Data Sheet B - Site Characterization

(A separate data sheet must be completed for each site)

Missouri WBID #: 17	09	İ	Site Location Description: $(0741276/4291179)$					
Site Lat/Long: #/	7.3		<u></u>	/	(- / (- / // // // // // // // // // // // //			
Date & Time: $iC/2$	104 0830		Facility Name:	-				
Personnel: NM/		i	Permit Number:					
Current Weather Conc	litions: Claudy	1	Weather Conditions for Past 7 days:					
Photo Ids: Upstream	Down:	strea	<u> </u>	Other:				
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Used Observed*:								
il Swimming	☐ Skin Diving	ī.i S	SCUBA diving	i Tubing	[] Water Skiing			
☐ Wind surfing	∷ Kayaking		Boating [Wading	☐ Rafting			
☐ Hunting	☐ Trapping		· ·	None of the above				
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evidence of recreation	aluses etc		ourng, medachey of	use, prioto-docume	Tration of			
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Surrounding Condition	ons*: (Mark all that p	romi	ote or impede recreat	ional uses. Attach pho	tos of evidence or			
unusual items of interest.)								
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Boating accesses	☐ State parks		National forests	[] Nature trails	Stairs/walkway			
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Site Locations Map(s): Attach a map of entire segment with assessment sites clearly labeled. Mark any other items that may be of interest. (Include photographs)

^{*}Some of this information is not intended to directly influence a decision on any one particular recreational use analysis but may point to conditions that need further analysis or that effect another use.

Page Two – Data Sheet B for WBID #:

Stream Morph Upstream Vi	ology: ew Physical Dimen	sions:			
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Water Chara	octeristics*: (Mark a	ill that apply.)			
Odor:	: Sewage	□ Musky □] Chemical	K None	: 11 Other
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Bottom Deposit:	□ Sludge	□ Solids □	Fine sediments	∤∆ None	() Other
Surface Deposit:	D Oil	□ Scum □	Foam	Ma None	□ Other
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Signed:	sio Juckle	Date: Pesources Posit	10/21/0	ý	
Organization:	MEC Worter K	<i>escurres</i> Posit	ion: Fnyires	nmental	Specialist

MEC Water Resources

Stream Morphology & Discharge Measurements

Date/Time: 10/21/04

Project Name/Number: _MSD UAA

Site/Transect ID Number: M.Cr. - 1 Start Time: 830 End Time: 9:05 Measured by: N W /CL Air Temp: 550F Weather Cond: Cloudy Stream Morphology Between Transects Length of Pools Length of Run Length of Riffles Start GPS Start GPS End GPS # Start GPS # End GPS # ft. ft. End GPS # 3 5 6 7 8 9 10 11 12 13 14 15 From LOB Stream Morphology At Transect LDB Angle: 38% 210 RDB Angle: 18%/100 Secchi (ft) Turbidity (NTU): Gravel ____ Sand ____ Channel Comp (%): Cobble Concrete black - 100 Other Bank Compostion Concrete block Width of Riparian Area: Riparian Corridor Density: Compostion of Riparian Vegitation: General Observations: Chain link Fence on RDB & Guard rail/road on LDB Stream Discharge Measurements Ending Stage: Beginning Stage Total Q: Average Velocity: Total Area: Channel Width: Distance from Datum to Water Surface: Start: Meas. type: Price AA Pygmy Data Coll. Type: Aqua Calc Sheet Aqua Calc Transect #:

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Field Data Sheets for Recreational Use Stream Surveys

Data Sheet B - Site Characterization

(A separate data sheet must be completed for each site)

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Date & Time: 10/21	104 9:10		Facility Name:						
Personnel: Nm/C	۷		Permit Number:						
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Photo Ids: Upstream	Down		am:	Other:					
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Used Observed*:	· · · · · · · · · · · · · · · · · · ·								
☐ Swimming	Skin Diving		SCUBA diving	Tubing	Water Skiing				
☐ Wind surfing	☐ Kayaking		Boating	.i Wading	Rafting				
L Hunting	Trapping		Fishing 5	None of the above	[] Other				
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☐ Boating accesses	State parks		National forests	Nature trails	Stairs/walkway				
□ No trespass sign	∡ Fence	X	Steep slopes	□ Other:					
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			_i	Discharge	/ Similar racking				
ロOther:					-1				
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Site Locations Map(s): Attach a map of entire segment with assessment sites clearly labeled. Mark any other items that may be of interest. (Include photographs)

^{*}Some of this information is not intended to directly influence a decision on any one particular recreational use analysis but may point to conditions that need further analysis or that effect another use.

Page Two - Data Sheet B for WBID #:

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MEC Water Resources

Stream Morphology & Discharge Measurements

Project Name/Number: MSD UAA

Date/Time: 10/21/04 9:10

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Field Data Sheets for Recreational Use Stream Surveys

Data Sheet B - Site Characterization

(A separate data sheet must be completed for each site)

Missouri WBID #: 170	1 Q	1	Site Location Des	crip	tion				
Site Lat/Long: /	<u> </u>				2 /	(4290788)			
Date & Time: 10/21	104 09:25		<u>Μ.Cr. ~</u> Facility Name:		5 (074/3/5	14290788)			
Personnel: Alm	164 09723	_	Permit Number:						
Personnel: NIM/C Current Weather Cond	litions: (1)	_							
Photo Ids: Upstream				\	Other:	Closely			
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☐ Wind surfing			Boating		Wading	☐ Rafting			
☐ Hunting	☐ Trapping		Fishing		None of the above				
Describe: (include num	ber of individuals i	recre	eating, frequency	of u	se, photo-docume	ntation of			
evidence of recreation									
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Surrounding Condition inusual items of interest.) TCity/county parks	☐ Playgrounds		MDC conservations lands National forests	on	[] Urban areas	f1 Campgrounds			
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Site Locations Map(s): Attach a map of entire segment with assessment sites clearly labeled. Mark any other items that may be of interest. (Include photographs)

^{*}Some of this information is not intended to directly influence a decision on any one particular recreational use analysis but may point to conditions that need further analysis or that effect another use.

Page Two - Data Sheet B for WBID #:

Upstream \ □ Riffle	View Physical Dim Width(ft)	ensions: Length(ft)	Ave. Depth(ft)	Max.	Depth(ft)
Run	Width(ft)	Length(ft)	Ave. Depth(ft)		Depth(ft)
∑ Pool	Width(ft) 40		500 Ave Depth(ft)		Depth(ft) 2.8
Ž' Flow		No No	Estimated (ft³/		
Downstrea	m View Physical [Dimensions:			
☐ Riffle	Width(ft)	Length(ft)	Ave. Depth(ft)	Max	. Depth(ft)
[] Run	Width(ft)	Length(ft)	Ave. Depth(ft)	Max.	Depth(ft)
t≱ Pool	Width(ft) 45	Length(ft) 🞖	ండు Ave. Depth(ft)	2.4 Max.	Depth(ft) 식, c
17x Flow	Present? ((es) No	Estimated (ft³/	sec): 2	de la serie
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60 %Cobb			and 10 %Silt	20 %Mud/C	lay %Bedrock
Odor: Color:	racteristics*: (Ma [] Sewage Ll Clear	∏ Musky □ Green	☐ Chemical ☐ Gray	⅓ None Li Milky	Other Other Brown
Bottom Deposit:	[] Sludge	□ Solids	 Fine sediments 	X None	□ Other
Surface Deposit:	□ Oil	I.I Scum	□ Foam	7 None	☐ Other
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Organization	n:MEC Whiter	Resources F	este: 10/21/00	enmenta/	Specialist

MEC Water Resources

Stream Morphology & Discharge Measurements

Project Name/Number: M50 UAADate/Time: 10/31/04 9:25Site/Transect ID Number: $M.C_{\rm E} = 3$

Start Tir	me: 9:25						End Time:	9:40)	
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Beginning Stage										
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Field Data Sheets for Recreational Use Stream Surveys

Data Sheet B - Site Characterization

(A separate data sheet must be completed for each site)

Site Lat/Long: j			Site Location Descr		
Date & Timer 4- /. /	78			-4 1074	1488 429052
Date & Time: 10/21/6	24 10500	— <u>+</u>	Facility Name:	10 /9,	1488 / 727032
Personnel: Nm/	4		Permit Number:		
Current Weather Con	ditions: Cloudy	1	Weather Conditions	s for Past 7 days:	Cloudy
Photo ids: Upstrean	n: Down	strea	am:	Other:	ciovag
-0079-0082	control st	ruc.	ture pic #5 - 0	083-0094	
Used Observed*:					
□ Swimming	□ Skin Diving	<u> </u>	SCUBA diving	Tubing	Water Skiing
□ Wind surfing	☐ Kayaking]	Boating (. Wading	Ci Rafting
Hunting Describe: (include nur	☐ Trapping	l ii f	Fishing (x	None of the above	e D Other
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☐ Boating accesses ☐ No trespass sign	☐ Playgrounds ☐ State parks ▼ Fence	[] [] []	MDC conservation lands National forests	X Urban areas	

Site Locations Map(s): Attach a map of entire segment with assessment sites clearly labeled. Mark any other items that may be of interest. (Include photographs)

^{*}Some of this information is not intended to directly influence a decision on any one particular recreational use analysis but may point to conditions that need further analysis or that effect another use.

Page Two - Data Sheet B for WBID #:

Upstream View Physical Dimensions:
│□ Riffle Width(ft) Length(ft) Ave. Depth(ft) Max. Depth(ft)
□ Run Width(ft) Length(ft) Ave. Depth(ft) Max. Depth(ft)
M Pool Width(ft) 45 Length(ft) >500 Ave. Depth(ft) 2-3 Max. Depth(ft) 41, 3
Flow Present? (fes No Estimated (ft³/sec): 2
Downstream View Physical Dimensions:
☐ Riffle Width(ft) Length(ft) Ave. Depth(ft) Max. Depth(ft)
☐ Run Width(ft) Length(ft) Ave. Depth(ft) Max. Depth(ft)
Pool Width(ft) 40 Length(ft) 100 Ave. Depth(ft) 2.0 Max. Depth(ft) 3.5
K Flow Present? (Yes No Estimated (ft³/sec):
Substrate*: (These values should add up to 100%) 70 %Cobble / 6 %Gravel %Sand 30 %Silt %Mud/Clay %Bedrock Aquatic Vegetation*: (note amount of vegetation or algal growth at the assessment site)
Water Characteristics*: (Mark all that apply.) Odor: □ Sewage □ Musky □ Chemical None □ Other
Thomas I would be continued to the conti
Color: Clear Green Gray Milky Other Brown Bottom Sludge Solids Fine Manager Other
Deposit: Sediments Set None
Surface
Comments: Please attach additional comments (including information from interviews) to this form. *This information is not to be used solely for removal of whole body contact recreation but rather is to provide a more comprehensive understanding of water conditions. Consequently, this information is not intended to direct influence a decision on the recreation use analysis but may point to conditions that need further analysis or that effect another use.
I, the undersigned, hereby affirm to the best of my knowledge, that all information reported on this UA datasheet is true and accurate. Signed:

MEC Water Resources

Stream Morphology & Discharge Measurements

Project Name/Number: M50 (1) MDate/Time: M

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Field Data Sheets for Recreational Use Stream Surveys

Data Sheet B - Site Characterization

(A separate data sheet must be completed for each site)

Site Lat/Long 7 9	Missouri WBID #: 17	<u>09</u>		Site Location Descr	iption:	
Personnel: NM/CL Permit Number: Current Weather Conditions: C/O C Weather Conditions for Past 7 days: Cloudy Photo Ids: Upstream: Downstream: Other: Swimming I Skin Diving I SCUBA diving I Tubing I Water S Used Observed*: Swimming I Trapping I Boating Wading I Rafting Hunting I Trapping I Fishing Mone of the above I Other Describe: (include number of individuals recreating, frequency of use, photo-documentation of evidence of recreational uses, etc. Surrounding Conditions*: (Mark all that promote or impede recreational uses. Attach photos of evidence in usual items of interest.) City/county parks Playgrounds I MDC conservation M Urban areas Campgrounds I ands Boating accesses I State parks National forests Nature trails I Stairs/wall No trespass sign M Fence M Steep slopes I Other: Evidence of Human Use*: Carrent Number: Other: Value of Paths/prints Dock/platform I Livestock Reviews	Site Lat/Long: 17	9	1			9 (4790323)
Permit Number: Current Weather Conditions: Cloudy Weather Conditions for Past 7 days: Cloudy Photo Ids: Upstream: Downstream: Other:	Date & Time: 10/21/	104 10130		Facility Name:		17 . 2. 60 23)
Photo Ids: Upstream: Downstream: Other: Surrounding Conditions*: {Mark all that promote or impede recreational uses. Attach photos of evidence of recreational uses, etc. Surrounding Conditions*: {Mark all that promote or impede recreational uses. Attach photos of evidence of solitors of interest.} Playgrounds	Personnel: Nm/	12	1			·
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Used Observed*: □ Swimming	Photo Ids: Upstream:		stre	am:	Other:	
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☐ Wind surfing ☐ Kayaking ☐ Boating ☐ Wading ☐ Rafting ☐ Hunting ☐ Trapping ☐ Fishing ▼ None of the above ☐ Other Describe: (include number of individuals recreating, frequency of use, photo-documentation of evidence of recreational uses, etc. Surrounding Conditions*: (Mark all that promote or impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence included in the promote of impede recreational uses. Attach photos of evidence in the promote of impede recreational uses. Attach photos of evidence in the promote of impede recreational uses. Attach photos of evidence in the promote of impede recreational uses. Attach photos of evidence in the promote of impede recreational uses. Attach photos of evidence in the promote of impede recreational uses. Attach photos of evidence in the promote of impede recreational uses. Attach photos of evidence in the promote of						
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Site Locations Map(s): Attach a map of entire segment with assessment sites clearly labeled. Mark any other items that may be of interest. (Include photographs)

^{*}Some of this information is not intended to directly influence a decision on any one particular recreational use analysis but may point to conditions that need further analysis or that effect another use.

Page Two - Data Sheet B for WBID #:

X Riffle	Width(ft) 😽	C Le	ength(ft)50	OO_ Ave	. Depth(ft)	Oct	Max. Depth((ft) 0,2_
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(X) Flow	Present?	(Yes)	No	Esti	mated (ft³/	sec): :		
Substrate*:	(These values	should ac		00%)				
%Cobble	` ,	%Gravel		Sand	%Silt	%M	ud/Clay 1/c	v %Bedrock
		<u> </u>	<u>-</u>			,- <u>-</u>		Concrete
Aquatic Veg	etation*: (no	te amoun'	t of vegeta	ation or a	lgal growth	at the ass	sessment sit	.e)
Some	2 benth	ic Al	998					
Water Chars	acteristics*: (/	Mark all th	nat annly)					
	☐ Sewage		Musky	□ Ch	emical	¾ None		ther
Odor:	1 JEVVAE					 	· · · ·	
Color:	★ Clear		Green	I Gra	a y	□ Milky	111 0	Other
•	<u>~</u>		Green Solids	□ Fin		□ Milky ☑ None		Other Other
Color: Bottom	✗ Clear		Solids	□ Fin	e liments	<u> </u>		
Color: Bottom Deposit: Surface Deposit:	✗ Clear☐ Sludge☐ Oil		Solids Scum	☐ Fin	e liments am	☑ None	C	Other
Color: Bottom Deposit: Surface Deposit: Comments: Planting information	Sludge Coil Dil Dil Dil Dil Dil Dil Dil	additional used solely anding of v	Solids Scum comment: y for remov	Fin seconds (including a) of whole tions. Cor	e diments am ng informa e body conta esequently, t	☑ None If None tion from act recreati this informa	interviews) interviews) interviews) interviews	Other
Color: Bottom Deposit: Surface Deposit: Comments: Pi This information ore comprehenfluence a decirate another undersignates the undersignates the tree to the comprehenfluence another undersignates the undersignates the tree tree tree tree tree tree tree	M Clear Sludge C Oil lease attach a on is not to be ensive understa ision on the re- use. gned, hereby a rue and accur	additional used solely anding of vocreation us	Solids Scum comment: y for remov vater conditions se analysis b	Fin section in sections. Corput may po	e diments am a body cont. Is sequently, to condition to condition wiedge, that	Mone Mone tion from act recreati this informations that	interviews) to the strong in but rather ation is not in need further that the strong in the strong i	Other Other to this form. is to provide a litended to direct analysis or that
Color: Bottom Deposit: Surface Deposit: Comments: Pl This informatic nore comprehe nfluence a deci	M Clear Sludge C Oil lease attach a on is not to be ensive understa ision on the re- use. gned, hereby a rue and accur	additional used solely anding of vocreation us	Solids Scum comment: y for remov vater conditions se analysis b	Fin section in sections. Corput may po	e diments am a body cont. Is sequently, to condition to condition wiedge, that	Mone Mone tion from act recreati this informations that	interviews) to the strong in but rather ation is not in need further that the strong in the strong i	Other Other to this form. is to provide a litended to direct analysis or that

MEC Water Resources

Stream Morphology & Discharge Measurements

Project Name/Number: MSD UAH

Date/Time: /D/21/64

Site/Transect ID Number: M.Cr. - 5

	Start Tin	ne: <u>10</u> :	3 <u>0</u>	_		···			End Time:	10:4	5
	Measured t	by: <u>/√ }</u>	M/CL	Air	Temp:	55°F		We	ather Cond:	Claus	14
				Stream N	forphol	ogy Betwe	en Transe	cts		-	
_		L	ength of Poo	ols		Length of Ru	n	L	ength of Riffi	les	
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Channel C	omp (%):	-					Sand				<u></u>
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	stance from		Water Surfac		Start:			Averag	je Velocity: _	· · · · · · · · · · · · · · · · · · ·	
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			35,5		0.00		<u> </u>						<u> </u>	
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Field Data Sheets for Recreational Use Stream Surveys

Data Sheet B - Site Characterization

(A separate data sheet must be completed for each site)

Missouri WBID #: 17	09		Site Location Descr	ription:	
Site Lat/Long: 180		i	m	-6	741850/429020
Date & Time: 10/21	04 10:55		Facility Name:	<u> </u>	741830/4240202
Personnel: Nm/c			Permit Number:		······································
Current Weather Conc	litions:	\rightarrow	Weather Condition	s for Past 7 days:	Cloudy
Photo lds: Upstream		stre	eam:	Other:	Covary -
pic #s-0039-009	5		-	·	
Used Observed*:	···				
☐ Swimming	Skin Diving	.]	SCUBA diving [Tubing	☐ Water Skiing
Wind surfing	!! Kayaking		Boating		1. Rafting
5 Hunting	Trapping	_	Fishing 2	None of the above	Other
Surrounding Condition unusual items of interest.)	al uses, etc.		note or impede recreat	ional uses. Attach pho	
☐ Boating accesses	State parks	! ——		D Nature trails	U Stairs/walkway
☐ No trespass sign	✗ Fence			E Other:	13 Stairs/walkway
Evidence of Human U	se*:	<u></u>	Steep stopes	_ Country	
□Roads	□ Foot paths/prints	S	□ Dock/platform	i.l Livestock Watering	□ RV/ATV Tracks
☐ Rope swings	[] Camping Si	tes	☐ Fire pit/ring	X NPDES Discharge	☐ Fishing Tackle
** Other: Grafitti	at bridge			7	site

Site Locations Map(s): Attach a map of entire segment with assessment sites clearly labeled. Mark any other items that may be of interest. (Include photographs)

^{*}Some of this information is not intended to directly influence a decision on any one particular recreational use analysis but may point to conditions that need further analysis or that effect another use.

Page Two – Data Sheet B for WBID #:

Upstream Viev	ogy: v Physical Dimeŋ.	sions:				
	/idth(ft) 15048	2 <length(ft) 150<="" td=""><td>Ave. Depth(ft)</td><td><i>C.</i> / Max. l</td><td>Depth(ft)_</td><td>0,2</td></length(ft)>	Ave. Depth(ft)	<i>C.</i> / Max. l	Depth(ft)_	0,2
<u> </u>	/idth(ft)	Length(ft)	Ave. Depth(ft)	Max. [Depth(ft)	
X Pool W	/idth(ft) 20	Length(ft)/50	Ave. Depth(ft)	0,5 Max. [Depth(ft)	0.7
्रिने Flow Pi	resent? (Yes) No	Estimated (ft³/s	sec):		
	/iew Physical Dim			·		
	/idth(ft) 50′	Length(ft) /cc			Depth(ft)	
<u> </u>	/idth(ft)	Length(ft)	Ave. Depth(ft)		Depth(ft)	
<u> </u>	/idth(ft) 75	Length(ft) <u>50</u> 1			Depth(ft)	
№ Flow Pa	resent? (Yes	No	Estimated (ft³/s	sec): 3		
Substrate*: (T	hese values shou	ld add up to 100°	%)			
20 %Cobble	%Grav	vel %Sa	nd %Silt_	%Mud/Cla	y 50	%Bedrock
Aquatic Vege	tatîon*: (note am	ount of vegetati	on or algal growth	at the assessm	ent site)	Concrete
Some	<u>benthic</u>	Algae				
Water Charac	teristics*: (Mark a	all that apply.)	40.00			
Odor:	□ Sewage	□ Musky	∏ Chemical	None التر	□ Othe	<u>er</u>
Odol.			□ Gray	El Mílky	☐ Othe	:r
Color:	X Clear	_ □ Green				
	X Clear (1 Sludge	☐ Green ☐ Solids	☐ Fine sediments	≯None	□ Othe	
Color: Bottom	· · -	!	☐ Fine	X None	Othe	:r
Color: Bottom Deposit: Surface Deposit:	(1 Sludge	□ Solids □ Scum	☐ Fine sediments	JX None	Othe	er
Color: Bottom Deposit: Surface Deposit: Comments: Ple *This information more comprehen	(1 Sludge Dil ase attach additions not to be used so sive understanding on on the recreations)	Solids Scum Conal comments (Solely for removal of water condition	☐ Fine sediments ☐ Foam	IX None ion from interv ct recreation but his information is	Otheriews) to the rather is to snot intended	his form. o provide a
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MEC Water Resources

Stream Morphology & Discharge Measurements

Project Name/Number: $\frac{M \leq D}{(M + A)} = \frac{(M + A)}{(M + A)}$ Date/Time: $\frac{(C/A)}{(M + A)} = \frac{(M + A)}{(M + A)}$ Site/Transect ID Number: $\frac{M + C_r}{(M + A)} = \frac{(M + A)}{(M + A)}$

	Start Ti	me:/	0155						End Time:	11:10	
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Channel	Comp (%):		Cobble	<u> 20 </u>	Gra	vel	Sand		Silt		_
			Other	80%	Carre	rete					
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Riparian	Corridor De	nsity:	Width of Ri	parian Area:		3-401	<u> KDG-</u>	10'			
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Time	Station #	Angle Coefficlent	Distance (from Initial Point-ft.)	Width	Depth (ft.)	Observation Depth	Revs.	Interval Time - in seconds	Vel At Point		ity (f/s) Mean in Ver- tical	Adjusted for Hor. Angle	Section Area (ft.²)	Section Discharge (cf
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Appendix B. Maline Creek Lateral Transects

Site	e #1	Site	#2	Site	#3	Site	: #4	Site	# 5	Site	#6
Distance	Depth	Distance	Depth	Distance	Depth	Distance	Depth	Distance	Depth	Distance	Depth
(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)
0	0	0	0	0	0	0	0	0	0	0	0.00
0.5	0.1	1	0.4	1	0.4	1	0.4	4	0.1	1	0.15
5.5	0.1	3	1.15	4	0.91	4	0.4	8	0.15	7	0.20
10.5	0.06	7	1.3	7	1.54	7	2.15	12	0.28	13	0.10
15.5	0.03	12	1.82	10	1.82	10	3.15	16	0.25	19	0.10
20.5	0.04	17	1.9	13	2.2	14	3.4	20	0.1	25	0.10
25.5	0.05	22	1.9	16	2.23	18	3.55	24	0.06	31	0.10
30.5	0.1	27	1.4	19	2.34	22	3.8	26	0	37	0.10
32.5	0.05	32	0.7	22	2.3	26	3.9			40	0.10
33.5	0	37	0.8	25	2.05	28	4.3			41	0.75
		42	0.7	28	1.76	30	2.6			44	0.60
		47	0.5	31	1.6	34	1			47	0.30
		52	0.4	34	1.32	38	0.8			50	0.30
		53	0	37	1	42	0.5			52	0.00
				39	0.4	46	0.3				
				41	0.2	47	0.3				
				42	0	48	0				

Appendix C. Maline Creek Water Quality Data

USGS Water Quality Data Collected at USGS 7005000 Maline Creek near Bellefontaine Neighbors (38°44'12.36", -90°,12',34.27" NAD 83)

		(30 44 12.30	5 , -90 , 12 ,34.27	NAD 03)		
Date/Time	Streamflow	Specific Conductivity	Fecal Coliform	E. coli	Condition	Recreation Season
(M/D/Y 24:00)	(cfs)	(uS/cm)	(col./100 mL)	(col./100 mL)	(Baseflow, Runoff)	(Yes, No)
8/1/96 9:45	4.6	558	3,400	2,900	Baseflow	Yes
9/23/96 15:30	940.0	147	57,000	54,000	Runoff	Yes
12/11/96 11:30	5.0	57	84		Baseflow	No
3/5/97 13:15	8.0	1,100	860	350	Baseflow	No
5/25/97 23:50	779.0	554	46,000	60,000	Runoff	Yes
6/10/97 9:15	5.0	1,160	430	910	Baseflow	Yes
8/26/97 8:30	2.0	551	5,000	4,300	Baseflow	Yes
9/2/97 16:34		151	3,600	1,000	unknown	Yes
12/15/97 14:50	2.7	3,570	880	500	Baseflow	No
2/24/98 10:45	5.4	1,240	230	100	Baseflow	No
4/15/98 6:55	478.0	249	54,000	40,000	Runoff	Yes
6/23/98 8:15	7.0	522	2,600	1,700	Baseflow	Yes
12/1/98 10:35	6.3	947	1,200	1,100	Baseflow	No
2/10/99 13:55	12.0	1,110	2,400	1,100	Baseflow	No
2/11/99 16:30	749.0	646	28,000	24,000	Runoff	No
5/4/99 23:22	492.0	807	34,000	23,000	Runoff	Yes
6/17/99 12:35	2.7	750	610	540	Baseflow	Yes
8/3/99 9:40	1.6	563	1,400	800	Baseflow	Yes
12/9/99 15:43	307.0	269	6,800	10,000	Runoff	No
1/6/00 10:05	0.5	346	1,000	2,400	Baseflow	No
2/29/00 9:58	3.0	716	160	240	Baseflow	No
4/7/00 3:38	300.0	657	7,200	5,800	Runoff	Yes
6/15/00 10:15	5.4	454	6,000	400	Baseflow	Yes
8/1/00 12:00	4.2	417	1,500	1,600	Baseflow	Yes
12/18/00 17:10	2.2	5,180	600	1,300	Baseflow	No
2/9/01 10:54	173.0	1,110	4,000	1,200	Runoff	No
2/27/01 15:55	9.0	1,090	240	210	Baseflow	No
4/10/01 23:31	351.0	790	600,000	280,000	Runoff	Yes
5/29/01 15:40	0.3	564	2,800	3,000	Baseflow	Yes
8/27/01 13:45	0.6	359	1,500	760	Baseflow	Yes
10/24/01 0:45	61.0	536	11,000	7,000	Runoff	Yes
12/10/01 17:00	1.7	1,050	46	42	Baseflow	No
2/5/02 9:00	6.4	1,280	54	120	Baseflow	No
3/9/02 3:32	171.0	2,120	1,000	800	Runoff	No
5/30/02 8:15	6.0	594	2,900	2,500	Baseflow	Yes
8/8/02 11:30	3.9	436	2,200	730	Baseflow	Yes
10/29/02 5:16	180.0	454	13,000	16,000	Runoff	Yes
12/17/02 9:35	3.2	3,710	1,200	1,600	Baseflow	No
2/4/03 10:15	9.0	1,810	310	140	Baseflow	No
4/16/03 21:09	416.0	548	14,000	12,000	Runoff	Yes
6/9/03 14:25	6.0	788	1,300	640	Baseflow	Yes
8/12/03 9:40	0.8	670	1,400	480	Baseflow	Yes
10/9/03 14:42	422.0	226	22,000	21,000	Runoff	Yes
2/9/04 14:30	8.6	5,870	20	10	Baseflow	No
3/4/04 12:38	544.0	604	11,000	4,800	Runoff	No
5/17/04 14:15	13.0	971	1,000	150	Baseflow	Yes
8/4/04 10:00	3.0	533	7,200	9,400	Baseflow	Yes

Appendix D

Maline Creek Recreational Use Attainability Interview Forms



River Des Peres and Maline Creek

	ent Stober	Interviewed by:	By Person	By Phone
Date 4/4	05	Time_18:20		
Reason for the in	terviewee selection Stream Tea	u#888		<u></u>
Location: River	Des Peres Maine Creex			
Description (GPS	optional)	· · · · · · · · · · · · · · · · · · ·	<u>-</u>	·,
·	LANGUERO		· · · · · · · · · · · · · · · · · · ·	
CONTACT INFO	- UNSUPERVISED CHILDREN DRMATION	SHALL NOT BE INT	ERVIEWED -	
egal Name D	avid Kuchenmeister			
Eurrent Address	2021 Hord Ave, Jenn	ings, MO 631	<u> 36 _ </u>	
urrant Phone #_	· · · · <u> </u>	·		-
Occupation	· · · · · · · · · · · · · · · · · · ·			
Age 43 yrs	•			
1		- · · - · · - · · - · · - · · · · · · ·		
PERSONAL USE	- Characterize the personal use	of the water by th	ne surveyed i	ndividual
PERSONAL USE How long have you	- Characterize the personal use	of the water by th	ne surveyed i	
PERSONAL USE How long have you Do you or your far	- Characterize the personal use u lived near this body of water?4_3 nily utilize River Des Peres and Maline (of the water by the yes.	ies?	
PERSONAL USE How long have you Do you or your far f YES, please chec	- Characterize the personal use a lived near this body of water? _ 43 nily utilize River Des Peres and Maline (k the activities and approximate numb	of the water by the yes.	ies?	
PERSONAL USE How long have you Do you or your far f YES, please chec <u>ACTIVITIES</u>	- Characterize the personal use u lived near this body of water?4_3 nily utilize River Des Peres and Maline (of the water by the yes.	ies?	
PERSONAL USE How long have you Do you or your far f YES, please chec ACTIVITIES wimming	- Characterize the personal use a lived near this body of water? _ 43 nily utilize River Des Peres and Maline (k the activities and approximate numb	of the water by the yes. Treek for water activities of time and the sea	ies?	or NO
PERSONAL USE How long have you Do you or your far f YES, please chec ACTIVITIES wimming ayaking	- Characterize the personal use a lived near this body of water? _ 4 3 mily utilize River Des Peres and Maline (k the activities and approximate number NUMBER OF TIMES/PER PERIOD	of the water by the yes. Treek for water activities of time and the sea	ies? (FLC)	or NO
PERSONAL USE How long have you Do you or your far If YES, please chec ACTIVITIES wimming Tayaking Tubing	- Characterize the personal use a lived near this body of water? _ 4 3 mily utilize River Des Peres and Maline (k the activities and approximate number NUMBER OF TIMES/PER PERIOD	of the water by the yes. Treek for water activities of time and the sea	ies? (FLC)	or NO
PERSONAL USE How long have you Do you or your far f YES, please chec ACTIVITIES wimming (ayaking ubing afting	- Characterize the personal use a lived near this body of water? _ 4 3 mily utilize River Des Peres and Maline (k the activities and approximate number NUMBER OF TIMES/PER PERIOD	of the water by the yes. Treek for water activities of time and the sea	ies? (FLC)	or NO
PERSONAL USE How long have you Do you or your far f YES, please chec ACTIVITIES wimming layaking ubing afting oating	- Characterize the personal use a lived near this body of water? _ 4 3 mily utilize River Des Peres and Maline (k the activities and approximate number NUMBER OF TIMES/PER PERIOD	of the water by the yes. Treek for water activities of time and the sea	ies? (FLC)	or NO
PERSONAL USE How long have you Do you or your far f YES, please chec ACTIVITIES wimming (ayaking batting batting vater Skiing	- Characterize the personal use a lived near this body of water? _ 4 3 mily utilize River Des Peres and Maline (k the activities and approximate number NUMBER OF TIMES/PER PERIOD	of the water by the yes. Treek for water activities of time and the sea	ies? (FLC)	or NO
PERSONAL USE How long have your far f YES, please chec ACTIVITIES wimming (ayaking ubing afting pating vater Skiing	- Characterize the personal use a lived near this body of water? _ 4 3 nily utilize River Des Peres and Maline (k the activities and approximate number of TIMES/PER PERIOD O O O O O O O O O O O O O O O O O O	of the water by the yes. Treek for water activities of time and the sea	ies? (FLC)	or NO
PERSONAL USE How long have you Do you or your far f YES, please chec ACTIVITIES wimming (ayaking ubing afting pating vater Skiing Other Samping	- Characterize the personal use a lived near this body of water? _ 43 nily utilize River Des Peres and Ma.ine (state activities and approximate number) NUMBER OF TIMES/PER PERIOD O O O O O O O O O O O O O O O O O O	of the water by the yes. Treek for water activities of time and the sea SEASON Age Calleding	ies? (FLC)	or NO
PERSONAL USE How long have you Do you or your far f YES, please chec ACTIVITIES wimming (ayaking ubing pating vater Skiing Other Sunding	- Characterize the personal use a lived near this body of water? _ 4 3 nily utilize River Des Peres and Maline (k the activities and approximate number of TIMES/PER PERIOD O O O O O O O O O O O O O O O O O O	of the water by the yes. Treek for water activities of time and the sea SEASON Age Calleding	ies? (FES) son you did. FLC	or NO

WITNESSED USE	- Characterize the observed use o	of the water by the	surveyed individual
<u>ACTIVITIES</u>	NUMBER OF TIMES/PER PERIOD	<u>SEASON</u>	FLOW CONDITION
Swimming	D	<u>-</u>	
Kayaking	0		
Tubing	0		
Rafting	$\overline{}$		
Boating	Ŏ		
Water Skilng	$\overline{0}$		
Other	1.	<u></u>	
Other _.	Lack of depth General Aesthetics, Water Quality, Lack of		
ANECTODAL US	E- Characterize the anectodal use		
ACTIVITIES	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming			
Kayaking	0		
Tubing 	<u>O</u>		
Rafting ————————————————————————————————————	0		
Boating	0		
Water Skiing	\circ		
Other Mr. Kuch	renneister was told that there	was a swimming	hole years ago in Ma
If NO , reasons why	rennuister was fold that there ar upstream of study reach at (General Aesthetics, Water Quality, Lack)		
Signature of Asses	sor Jut M		1
Signature of Interv	viewed Individual		
Date 4/4/0	5		



River Des Peres and Maline Creek

The purpose of this survey is to aid in identifying current recreational uses of the River Des Peres and Maline Creek. Assessor Rence Warten Interviewed by: By Person 🕝 1/10/05 Time 9:25 Am Adline Creek

Rellefontaine, Pardue, Magan Ford. Reason for the interviewee selection Location: / Description (GPS optional) - UNSUPERVISED CHILDREN SHALL NOT BE INTERVIEWED -**CONTACT INFORMATION** Larry Buschmann Legal Name____ WRes. Field office Pollar - USGS Current Address Current Phone # 573-308-3683 Hydologic Tech Occupation _____ Age___ PERSONAL USE How long have you lived near this body of water? Do you or your family utilize River Des Peres and Ma ine Creek for water activities? If YES, please check the activities and approximate number of time and the season you did. <u>ACTIVIT</u>IES NUMBER OF TIMES/PER PERIOD SEASON FLOW CONDITION Swimming Kayaking Tubing Rafting Boating Water Skiing Other (General Aesthetics, Water Quality, Lack of Depth, Weather, Safety, Velocity) Otner Wah on Rwent Creek.

VITNESSED USE			
ACTIVITIES	NUMBER OF TIMES/PER PERIOD	<u>SEASON</u>	FLOW CONDITION
wimming	_		
layaking		_	
ubing		-	_
lafting		-	-
Boating	-		
Vater Skiing		<u> </u>	_
Other	Journ Dealing Suge for General Aesthetics, Water Quality, Lack o		Low
ANECTODAL US			
ANECTODAL US	E		
ACTIVITIES Wimming	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
ayaking			
ubing			
Rafting	·		
Boating			
Nater Skiing	+ = =		
Other			
Other_	General Aesthetics, Water Quality, Lack o	f Depth, Weather, Safe	ty, Velocity)

Belle fontaine Pudue Morgan Ford



River Des Peres and Maline Creek

The purpose of this survey is to aid in identifying current recreational uses of the River Des Peres and Maline Creek. interviewed by By Person -By Phone Date 10-21-04 Reason for the interviewee selection yard butts up against Location: River Des Peres Maline Creek adjacent to stream on south Description (GPS optional) - UNSUPERVISED CHILDREN SHALL NOT BE INTERVIEWED -CONTACT INFORMATION Letused - lady at 905 Delaird drive Legal Name Current Address Current Phone # Occupation____ PERSONAL USE How long have you lived near this body of water? Do you or your family utilize River Des Peres and Maline Creek for water activities? If YES, please check the activities and approximate number of time and the season you did. NUMBER OF TIMES/PER PERIOD **ACTIVITIES FLOW CONDITION** Swimming Kayaking Tubing Rafting Boating 0 Water Skiing Other (General Aesthetics, Water Quality, Lack of Depth, Weather, Safety, Velocity) Other

WITNESSED USE	 -		
ACTIVITIES_	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming	0		
Kayak'ng			
Tubing	T O		
Rafting	Ö		
Boating	0		
Water Skiing			
Other - 5	ust maintenance crews		
If NO , reasons why	1110		ty Velocity)
Other			<u></u>
ANECTODAL US	E		<u></u>
ACTIVITIES	NUMBER OF TIMES/PER PERIOD	<u>SEASON</u>	FLOW CONDITION
Swimming	0		
Kayaking	0		
Tubing	0		
Rafting			
Boating	0		
Water Skiing			
Other	Ö		
If NO , reasons why (Other	General Aesthetics, Water Quality, Lack o	f Depth, Weather, Safe	ty, Velocity)
Signature of Assess	sor Unit		
Signature of Interv	lewee	<u>-</u>	
Date /0-2/	- 01		



River Des Peres and Maline Creek

The purpose of thi	is survey is to aid in identifying curren	it recreational uses of the	River Des Peres and Maline Creek.
Assessor_ /	ate Monts	Interviewed by: 8y	Person By Phone
Date_ (C) 6	21-04	Time 9:00	6.n
Reason for the inte	erviewee selection Lives on	Street next	to Creek _
	Des Peres Maline Creek		,
Description (GPS o	ptional) Larawic Street	t is South of	stren
	- UNSUPERVISED CHILDREN	SHALL NOT BE INTERV	IEWED -
CONTACT INFO Lega! Name	RMATION Annie Calla 9333 Lavamie (314) 259 - 2172		
Current Address	9333 Lakemie	Shoot	·· ···································
Current Phone #	(314) 388 ~2172	<u> </u>	
Occupation \bar{h}	In So and fe		
Age3 <i>O</i>	3kils - 9,5,	<i>?</i>	
PERSONAL USE			
How long have you	lived near this body of water?	4 1.26	
	illy utilize River Des Peres and Ma'ine (YES or NO
	the activities and approximate numb		()
ACTIVITIES	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming	0		
Kayaking	0		
Tubing	0		
Rafting			
Boating	+ 0		······································
Water Skling			
Other		<u> </u>	
	C^r		
If NO , reasons why (Safety General Acsthodics, Water Quality, Lac	k of Depth, Weather, Safet	y, Velocity)

R PERIOD	SEASON	FLOW CONDITION
<u></u>	- A	
	l	
ina ar	out every one	e in a white
I do A	t of Depth, Weather, Safet	
R PERIOD	<u>SEASON</u>	FLOW CONDITION
r Quality, Lac	k of Depth, Weather, Safet	ty, Velocity)
1/2		
1		
1		



River Des Peres and Maline Creek

The purpose of this survey is to aid in identifying current recreational uses of the River Des Peres and Maline Creek. Interviewed by: By Phone Date_ 10-21-64 Reason for the interviewee selection Work 5 at 150/forfaire River Des Peres Maline Creek Location: Description (GPS optional) to alty located Next to (rest - UNSUPERVISED CHILDREN SHALL NOT BE INTERVIEWED -**CONTACT INFORMATION** Tankika I hamps Legal Name Current Address Current Phone # PERSONAL USE How long have you lived near this body of water? Do you or your family utilize River Des Peres and Maline Creek for water activities? If YES, please check the activities and approximate number of time and the season you did. NUMBER OF TIMES/PER PERIOD **ACTIVITIES** FLOW CONDITION Swimming Kayaking Tubing Rafting Boating Water Skling Other If NO, reasons why (General Aesthetics, Water Quality, Lack of Depth, Weather, Safety, Velocity) Other

ONDITION
ON IDITION
ONDITION



River Des Peres and Maline Creek

The purpose of this survey is to aid in identifying current recreational uses of the River Des Peres and Maline Creek. athen Muerks Interviewed by: By Phone Reason for the interviewee selection Works at Belfontain Gardens Norsing facility Maline Creek Location: River Des Peres Description (GPS optional) facility is adjacent to Creek - next to Belfortine - UNSUPERVISED CHILDREN SHALL NOT BE INTERVIEWED -CONTACT INFORMATION Valerie Warters Legal Name Current Address Age____ **PERSONAL USE** How long have you lived near this body of water? ____ / menths - liver Do you or your family utilize River Des Peres and Maline Creek for water activities? If YES, please check the activities and approximate number of time and the season you did. NUMBER OF TIMES/PER PERIOD **ACTIVITIES** SEASON FLOW CONDITION **Swimming** Kayaking Tubing Rafting Boating Water Skiing Other If NO, reasons why (General Aesthetics, Water Quality, Lack of Depth, Weather, Safety, Velocity) Biological Safety - (Mosquitos, Snakes)

WITNESSED USE	_		
ACTIVITIES_	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming	\mathcal{O}		
Kayaking			
Tubing	0		
Rafting	Ō		
Boating	<u> </u>		
Water Skiing			i
Other	0		
	General Aesthetics, Water Quality, Lack o	f Depth, Weather, Safe	ty, Velocity)
ANECTODAL US	E		
<u>ACTIVITIES</u>	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming	0		
Kayaking			
Tubing	0		
Rafting	0		
Boating	\mathcal{C}		
Water Skiing	<i>C</i>		
Other	0		
If NO , reasons why (Other	General Aesthetics, Water Quality, Lack o	f Depth, Weather, Safe	ity, Velocity)
Signature of Asses	sor A		
Signature of Interv		ter	
Date /	21-04		



River Des Peres and Maline Creek

The Science of Water Quality The purpose of this survey is to aid in identifying current recreational uses of the River Des Peres and Maline Creek. Interviewed by: By Phone Date Reason for the interviewee selection Location: River Des Peres Maiine Creek Description (GPS optional) Rella Fontain - UNSUPERVISED CHILDREN SHALL NOT BE INTERVIEWED -CONTACT INFORMATION Legal Name Current Address PERSONAL USE How long have you lived near this body of water? _ Do you or your family utilize River Des Peres and Maline Creek for water activities? If YES, please check the activities and approximate number of time and the season you did. **ACTIVITIES** NUMBER OF TIMES/PER PERIOD **SEASON** FLOW CONDITION Swimming Kayaking Tubing Rafting Boating Water Skiing Other If NO, reasons why (General Aesthetics, Water Quality, Lack of Depth, Weather, Safety, Velocity)

<u>ACTIVITIES</u>	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming	0		
Kayaking	0		
Tubing	0		
Rafting	0	1021	
Boating	0		
Water Skling	0		
Other	0		
If NO , reasons why (Other	General Aesthetics, Water Quality, Lack of As Access	f Depth, Weather, Safe	ty, Velocity)
anectodal us	E		
<u>ACTIVITIES</u>	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming	0	~	
			•
	0		
Tubing	0		
Tubing	0		
Tubing Rafting	0 0	,	
Tubing Rafting Boating	0 0		
Tubing Rafting Boating Water Skiing	0 0 0		
Kayaking Tubing Rafting Boating Water Skiing Other If NO , reasons why	0		i
Tubing Rafting Boating Water Skiing Other If NO, reasons why Other Signature of Asses	General Aesthetics, Water Quality, Lack o		i
Tubing Rafting Boating Water Skiing Other If NO, reasons why Other Signature of Asses	General Aesthetics, Water Quality, Lack o		i

4 vebidences w/ septic systems - suspects leaking or multimetime - gets odor of septic system in park drainage on occassion."



River Des Peres and Maline Creek

The Science of Water Quality

	survey is to aid in identifying current		
Assessor Act	& Much	Interviewed by: By	Person By Phone
Date / / - (41-04	Time $\int 0.3$	
Reason for the inter	rviewee selection Works in Wi	estrich Trucking Co	. Pacity
	es Poros Maline Creek		
Description (GPS op	otional) Borders Creek to	North	
		·	
	- UNSUPERVISED CHILDREN	SHALL NOT BE INTERV	IEWED -
CONTACT INFO	\mathcal{F}		
Current Address	GOO ST CYR RE	,	
	314) 494-1024		
	List		
Age47			
PERSONAL USE		,	
How long have you	Eved near this body of water? 7	yr5	
Do you or your fam	lly utilize River Des Peres and Maline C	Preek for water activities?	YES or NO
If YES , please check	the activities and approximate number	er of time and the season	you did.
<u>ACTIVITIES</u>	NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
Swimming	0		
Kayaking			
: Tubing 	0		
Rafting	<u> </u>	<u> </u>	
Boating	<i>O</i>		
Water Skiing	<i>O</i>		
Other			
	-		
If NO , reasons why /	General Aesthetics, Water Quality, Lac	ck of Depth. Weather, Safe	tv. Velocity)
	10 access - fenced	Dopan, 171101, 2410	y,y,
Other R	20 CACCES - WEEK		· · · · · · · · · · · · · · · · · · ·

ACTIVITIES .	NUMBER OF TIMES/PER PERIOD	<u>SE</u> ASO <u>N</u>	FLOW CONDITION
Swimming	\bigcap	<u></u>	
Kayaking	+ $ -$		
Tubing	0		
Rafting	Ď	N	
Boating			
Water Skiing	0		
Other	0		
Other	(General Aesthetics, Water Quality, Lack of Has seen Maint Nanc	c Cotus	
ANFCTODAL U	SF.		
		SEASON	FLOW CONDITION
ACTIVITIES	SE NUMBER OF TIMES/PER PERIOD	SEASON	FLOW CONDITION
ACTIVITIES		SEASON	FLOW CONDITION
ACTIVITIES Swimming Kayaking		SEASON	FLOW CONDITION
ACTIVITIES Swimming Kayaking Tubing		SEASON	FLOW CONDITION
ACTIVITIES Swimming Kayaking Tubing Rafting		SEASON	FLOW CONDITION
ACTIVITIES Swimming Kayaking Tubing Rafting Boating		SEASON	FLOW CONDITION
ACTIVITIES Swimming Kayaking Tubing Rafting Boating Water Skiing		SEASON	FLOW CONDITION
ACTIVITIES Swimming Kayaking Tubing Rafting Boating Water Skiing Other	NUMBER OF TIMES/PER PERIOD O O O O O O O O O O O O O O O O O O		
ACTIVITIES Swimming Kayaking Tubing Rafting Boating Water Skiing Other	NUMBER OF TIMES/PER PERIOD O O O O O O O O O O O O O O O O O O		
ACTIVITIES Swimming Kayaking Tubing Rafting Boating Water Skiing Other	NUMBER OF TIMES/PER PERIOD O O O O O O O O O O O O O O O O O O		
Swimming Kayaking Tubing Rafting Boating Water Skiing Other	NUMBER OF TIMES/PER PERIOD O O O O O O O O O O O O O O O O O O		